EXCHANGE RATE POLICY FOR A SMALL OPEN ECONOMY IN A WORLD OF FLOATING RATES: THE CASE OF SOUTH AFRICA

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THE AUTHOR

Dr. Merle Holden is Senior Lecturer in Economics, University of Natal, Durban. She obtained a B.Com. (Hons.) degree at the University of Natal and a doctorate at Duke University, and was previously Associate Professor at George Mason University. Dr. Holden held a fellowship in the ERU from January-June 1985, during which period she undertook the research on which this paper is based.

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1. INTRODUCTION

The aim of this paper is to examine the flexibility of exchange rate policy in South Africa since 1973. Casual empiricism suggests that over the last few years the variability of the exchange rate has increased. As the De Kock Commission (1985) describes the 'market-based' exchange rate policy which is presently being followed as a managed float, this places policy close to one end of the spectrum of flexibility. In a world of generalised floating which we have enjoyed since 1973, it is however difficult to determine what has been happening to the competitiveness of the economy given the changes not only in the exchange rates of South Africa's major trading partners but also in the differences in the rates of inflation between South Africa and these countries. Therefore the purpose of this paper will be to determine the course of the competitiveness of the economy since the move to generalised floating in 1973 by the calculation of appropriate measures of the changes in exchange rates. These measures will then be examined in the light of the purchasing power parity theory of the exchange rate, and their effect on resource allocation in the export sector will be ascertained. In addition, the paper will address the issues surrounding the choice of an appropriate exchange rate regime and evaluate the suitability of the more flexible exchange rate policy which has been observed recently.

2. NOMINAL AND REAL EFFECTIVE EXCHANGE RATES

In the fixed exchange rate world that existed prior to 1971, exchange rate developments could be satisfactorily described in terms of the numeraires of the international monetary system - fine ounce gold equivalents or the dollar exchange rate. In a world of variable gold prices and frequent exchange rate changes, however, using a bilateral exchange rate no longer gives an accurate indication of the effects of movements in a country's exchange rate. For example, say the rand depreciates against the US dollar by 10 per cent but the dollar appreciates against all other currencies by 20 per cent. Changes in the rand/dollar rate alone indicate an increase in the competitiveness of the rand when in fact it has lost competitiveness both in the US and the rest of the world.

As a result, a number of alternative measures have been developed to give a more accurate indication of exchange rate movements. The most widely used of these is the trade weighted exchange rate which is also known as the effective exchange rate. In its simplest form, bilateral trade weights are calculated which are then multiplied by exchange rate changes in order to obtain a weighted average index of exchange rate movements. Many alternative weighting schemes can be used depending on the use to which the calculations are to be put and the amount of data available. As Rhomberg (1976 p.69) has pointed out: "The proper choice of weights for an index of the effective exchange rate depends on its purpose. An index of the effective exchange rate intended to be used in connection with the estimation or analysis of exchange rate effects on the trade balance has to use as weights some estimates however imperfect, of the relative influence of changes in the prices of currencies of various foreign countries on the trade balance of the home country".

In constructing the weights for effective exchange rate claculations, a number of issues must be considered. The first

of these is the structure of the weights being used. Clearly exchange rate changes have an impact on most economic variables in an economy - merchandise exports and imports, the overall balance of payments, the balance on current account, the output of tradeable vis-a-vis non-tradeable goods and so on. Effective exchange rates could be calculated to assess the impact on any variable that is affected by exchange rate changes. For each such calculation there would be an appropriate vector of weights which would enable the impact on the target variable to be calculated. Several such weighting schemes exist. For example, the IMF's multilateral exchange rate model (1) enables effective exchange rates to be calculated for the industrial countries using weights derived from elasticities of substitution in production and expenditure elasticities in consumption. The appropriate elasticities, and therefore the appropriate weights, can be derived with even more accuracy for individual countries by using elasticities calculated using models such as the ORANI model of the Australian economy (2) developed for the Industries Assistance Commission. While the development of general equilibrium type models which would enable such weights to be calculated for South Africa may be an important research project, currently no such weights are available and some sort of trade weighting scheme must be used. Trade weights can be either bilateral or multilateral. Even here, a number of issues are involved in the choice of weights. Using bilateral weights has the obvious drawback of ignoring so-called third country effects which are potentially important. Say South Africa competes in the UK with countries with which it does not trade. Even though the exchange rate of one of these countries depreciates thus giving its exports a competitive advantage over South Africa in the UK market, the use of bilateral weights will indicate that there has been no loss of competitiveness for South African exporters. In order to measure third country effects, multilateral weights must be used. However, this requires access to large data bases frequently not available in countries like South Africa on a timely basis and it was, therefore, decided for the purposes of the calculations in this paper, to use bilateral

weights. The formula used to calculate trade weighted exchange rates is:

$$NER = \sum_{j=1}^{15} a_j D_j^t$$

where: $D_j^t = ((ER_j^t - ER_j^{t-1})/ER_j^{t-1}) * 100$

a_j = trade weight (as defined below) of South Africa with country j

ER_j^t = units of foreign currency per rand at time t.

Further issues are involved in the calculation of trade weights for South Africa. One of these is whether gold should be included or excluded from the trade data. If the index is being used to assess the competitiveness of the rand, whether or not to include gold in calculating the trade weights is an important issue. If changes in the exchange rate have no effect on the supply of, or demand for gold, then a good case can be made for excluding it from the calculation. However, the supply of gold in South Africa has been seen to be affected by the exchange rate. Alternatively, if it is felt that export or import competing industries must develop in order to insure against the day when gold stocks are exhausted, it might be desirable to measure competitiveness using trade weights from which gold has been excluded in order to assess the impact of exchange rate changes on the non-gold industrial sector.

An additional problem is how to deal with South Africa's trade with other African countries. Information on this trade is not provided by official South African statistics nor are exchange rates and price indices available on a timeous basis for many of the countries in question. A variety of solutions to this problem are available. One of the major banks, in constructing its index, treats all trade with Africa as if it were with Zimbabwe. However, this probably creates more problems than it solves. Much of the trade is on a bilateral barter basis and in any case the exchange rates of many of the African countries move closely with the rand. It was, therefore, decided to treat these currencies as if they moved directly with

the rand.

Obviously trade weights can be calculated using a variety of trade data. Import weights, export weights or a combination of the two, can be used. Typically import weights would be used in circumstances if the competitiveness of import competing industries were being evaluated, and export weights alone would be used if calculations were being made regarding export (as opposed to traded goods) competitiveness. Weights calculated using a combination of import plus export data would give a broad indication of the effect of exchange rate changes on the competitiveness of the traded goods sector.

In this paper effective exchange rates were calculated using import weights, export weights both including and excluding gold, and import plus export weights both including and excluding gold. The formulae for the trade weights for the five different measures are:

(a) Nominal effective exchange rate calculated using import weights (NEER1):

$$a_j = I_j / \sum_{j=1}^{15} I_j$$

(b) Nominal effective exchange rates calculated using import+export weights including gold (NEER2):

$$a_j = (I_j + E_j) / \sum_{j=1}^{15} (I_j + E_j)$$

(c) Nominal effective exchange rates calculated using import+export weights excluding gold (NEER3):

$$a = (I_j + E_j - G_j) / \sum_{j=1}^{15} (I_j + E_j - G_j)$$

(d) Nominal effective exchange rates calculated using export weights including gold (NEER4):

$$a_j = E_j / \sum_{j=1}^{15} E$$

(e) Nominal effective exchange rates calculated using export weights excluding gold (NEER5):

$$a_j = (E_j - G_j) / \sum_{j=1}^{15} (E_j - G_j)$$

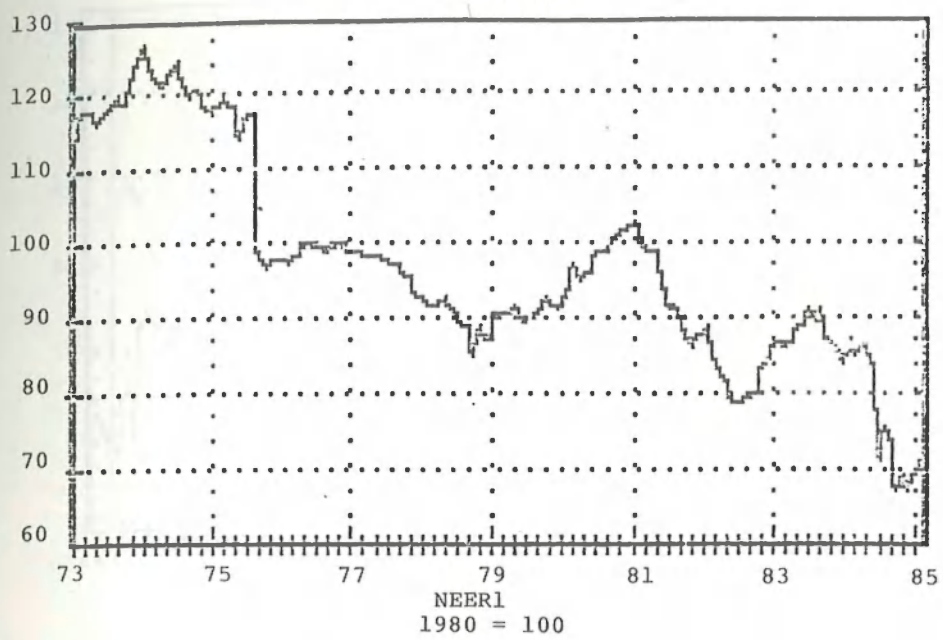
The effective rates were calculated on a monthly basis for the period January to February 1985. In Appendix A the countries included in the calculations and the data sources are listed. Diagrams 1-5 show the results of these calculations. For all five series the nominal effective rates peaked in the 1974 period, slumped sharply in the 1975-76 period, rose again in 1979-80 and then declined to present levels. While the direction in which the series have moved are all similar, the degree by which the changes have occurred are not. How closely the series move together can be gauged from the correlations between the series. Table 1 is a correlation matrix of cross correlations between the five series.

Table 1 Correlation Matrix between Effective Exchange Rate Series

	NEER1	NEER2	NEER3	NEER4	NEER5
NEER 1	1,000	,9966	,9856	,9919	,8570
NEER 2	,9966	1,000	,9739	,9987	,8245
NEER 3	,9956	,9739	1,000	,9687	,9292
NEER 4	,9919	,9987	,9687	1,000	,8170
NEER 5	,8570	,8245	,9292	,8170	1,000

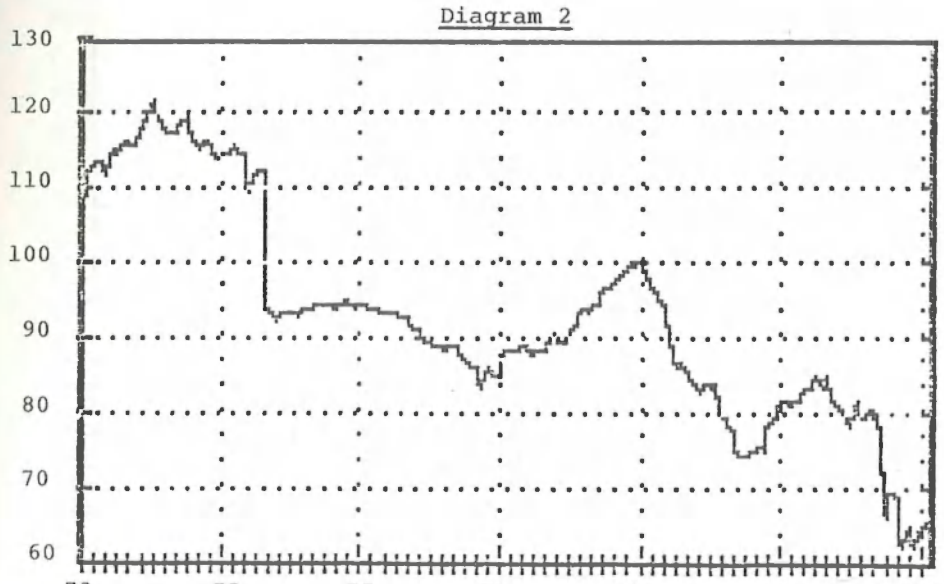
As the correlation matrix shows, the relationship between the series is very close except for NEER5 (the series calculated using export weights excluding gold). This can be interpreted in a number of different ways. One view could be that this series should be ignored when evaluating exchange rate developments. An alternative view could be that gold so dominates the export sector of the South African economy that its effect on the exchange rate overwhelms other tradeables, and that in order to evaluate the effect of exchange rate movements on these products,

Diagram 1



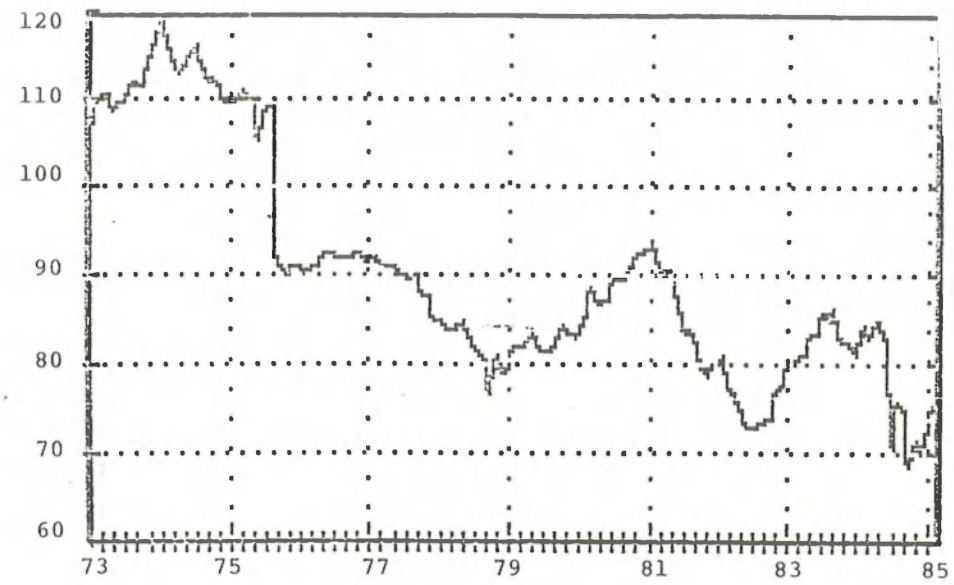
NEER1
1980 = 100

Diagram 2



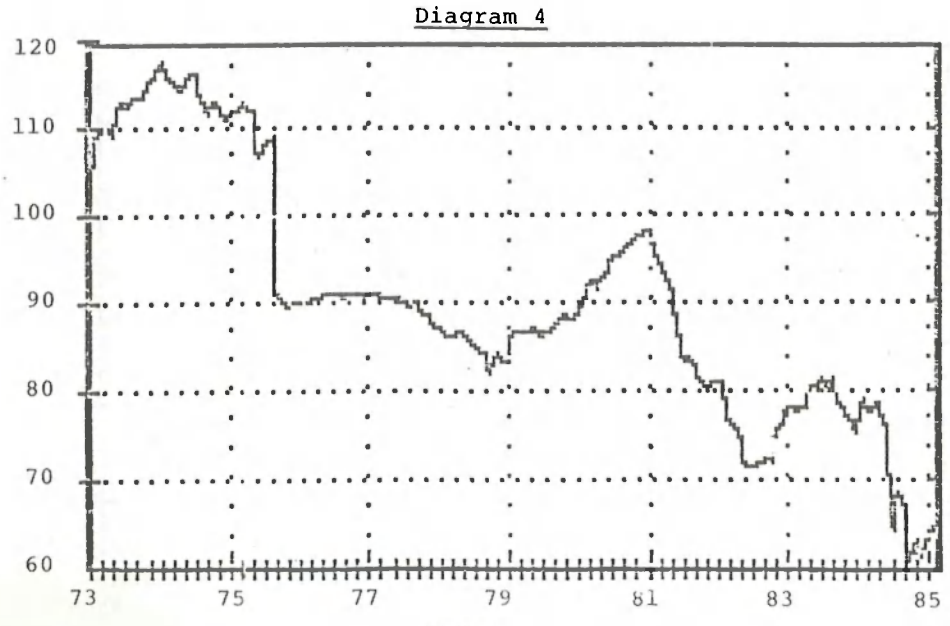
NEER2
1980 = 100

Diagram 3



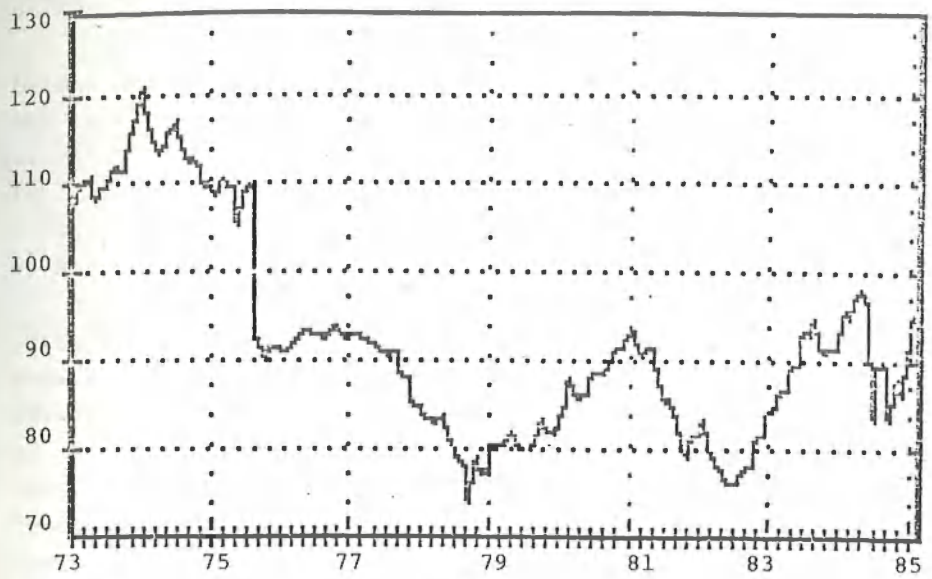
NEER3
1980 = 100

Diagram 4



NEER4
1980 = 100

Diagram 5



NEER5
1980 = 100

NEER5 is the appropriate series to examine. The graphs of the various series indicate that the nominal depreciation of NEER5 is smaller than is indicated by either the series based on import weights, the series based on import plus export weights or the series based on export weights including gold. What is also interesting is that all series except NEER5 indicate that the trade weighted measure of the depreciation of the rand is at an all-time low point. The NEER5 series, however, was at a lower point in 1977. At least in nominal terms, the stimulus to non-gold exports provided by the recent devaluation is not as great as the series based on composite weights would indicate. Another striking point that emerges from these diagrams is that although the correlations between the series is generally quite high, indicating that changes in the various series are similar, the levels of the series at any particular time exhibit variations of as much as 10 per cent. This makes judging the appropriateness of the level of any particular exchange rate difficult, to say the least.

While the trade-weighted exchange rate provides useful information on overall developments in competitiveness, the picture it provides is incomplete. Changes in the relative prices of domestic traded goods are a function not only of changes in relative exchange rates but also relative price levels. Say, for example, that the rand were to depreciate in nominal terms by 5 per cent but that the rate of inflation in South Africa were 10 percentage points higher than in its trading partners, then the nominal effective rate calculations would show a depreciation of the rand but, in real or inflation adjusted terms, the rand would actually have lost competitiveness by approximately 5 per cent. In order to measure real exchange rate changes, relative inflation rates must be taken into account. This necessitates the construction of an index of the real exchange rate (RER) which is a measure of exchange rate changes adjusted for changes in the level of relative prices. Algebraically, it is written as:

$$RER = \sum_{j=1}^{15} a_j D_j . P_{SA}^t / P_j^t$$

Real exchange rate series were constructed using the same set of weighting patterns and for the same period as for the nominal exchange rate series (3). The matrix of correlations between the five series is shown in Table 2.

Movements in the series are shown in Diagrams 6-10. The range over which the real effective exchange rate has fluctuated is smaller than that over which the nominal series have moved. For series REER1, REER3 and REER5, the real effective exchange rate which held at the end of February 1985 was less than 10 per cent below that of the 1975-78 period. The sharp dichotomy

Table 2 Matrix of Correlations Between Real Effective Exchange Rates (a)

	REER1	REER2	REER3	REER4	REER5
REER1	1,000	,9831	,9977	,9524	,9741
REER2	,9831	1,000	,9712	,9921	,9184
REER3	,9977	,9712	1,000	,9341	,9858
REER4	,9524	,9921	,9341	1,000	,8626
REER5	,9741	,9184	,9858	,8626	1,000

Note (a) REER1 ... REER5 are the real exchange rates that correspond to the weights used for the nominal exchange rate calculations that appear above.

between the series in which gold is used to calculate the trade weights and that from which gold was excluded is also evident in the real exchange rate series. The REER2 and REER4 series both

Diagram 6

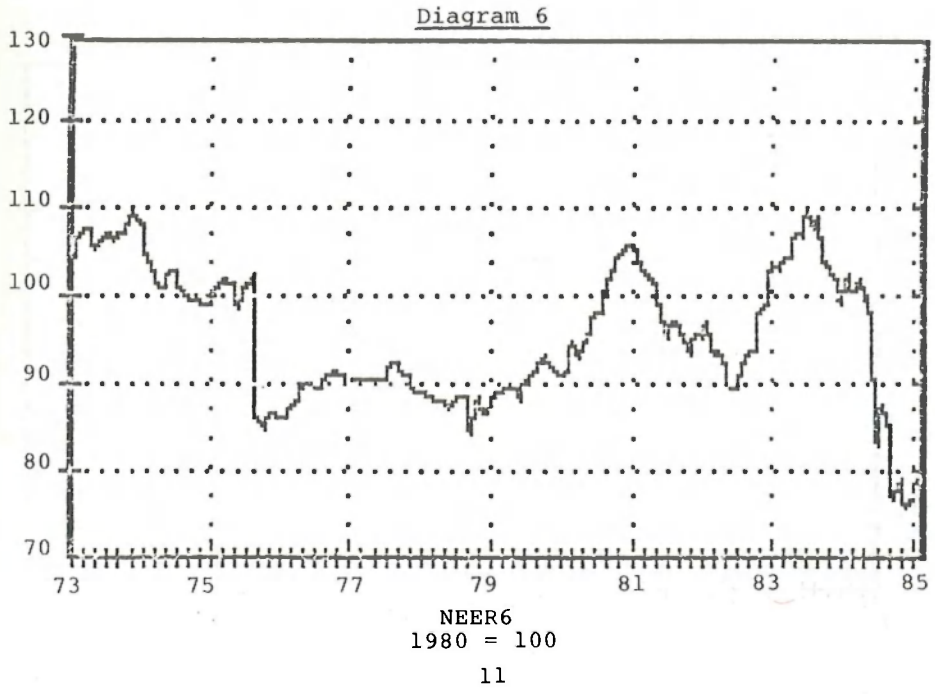
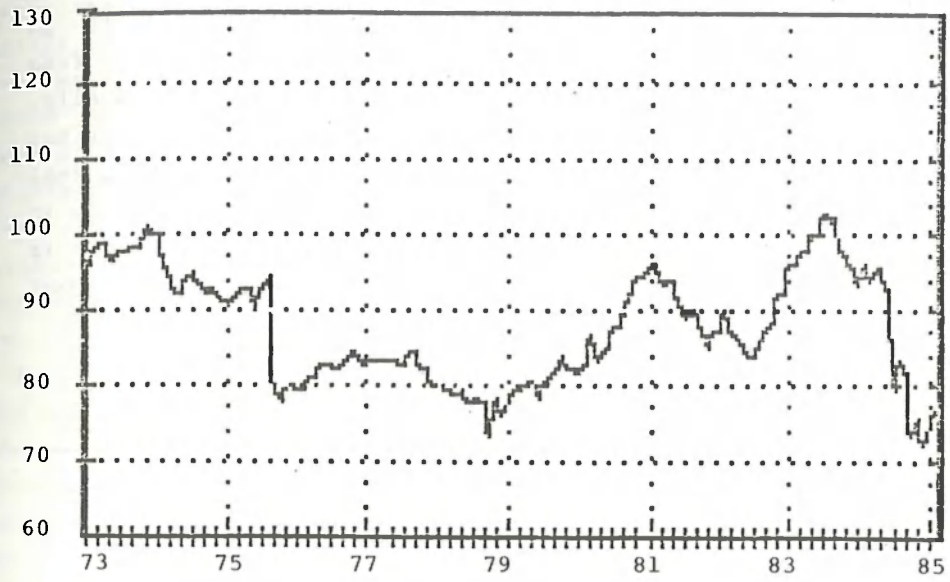
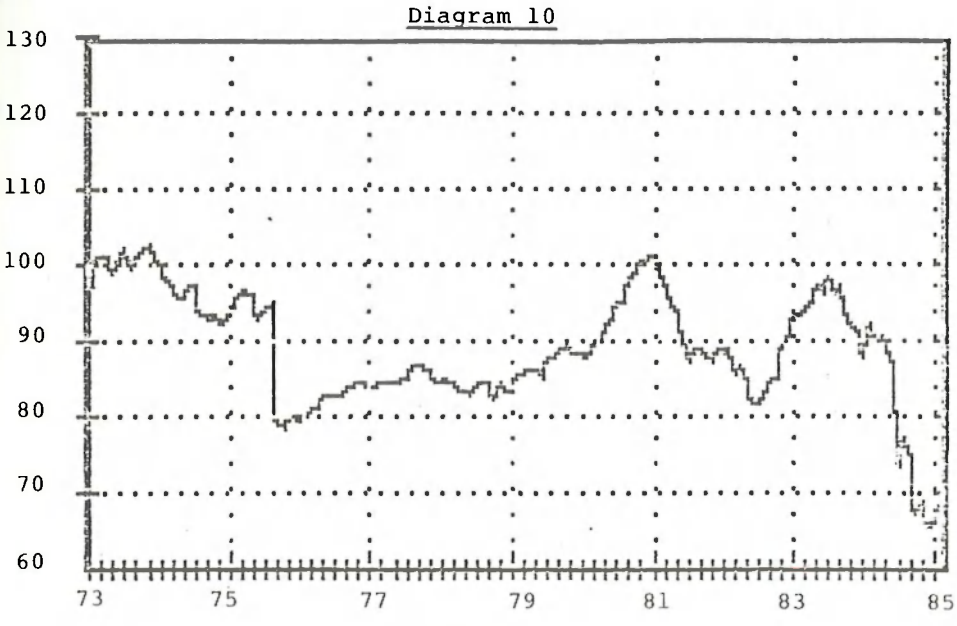


Diagram 9



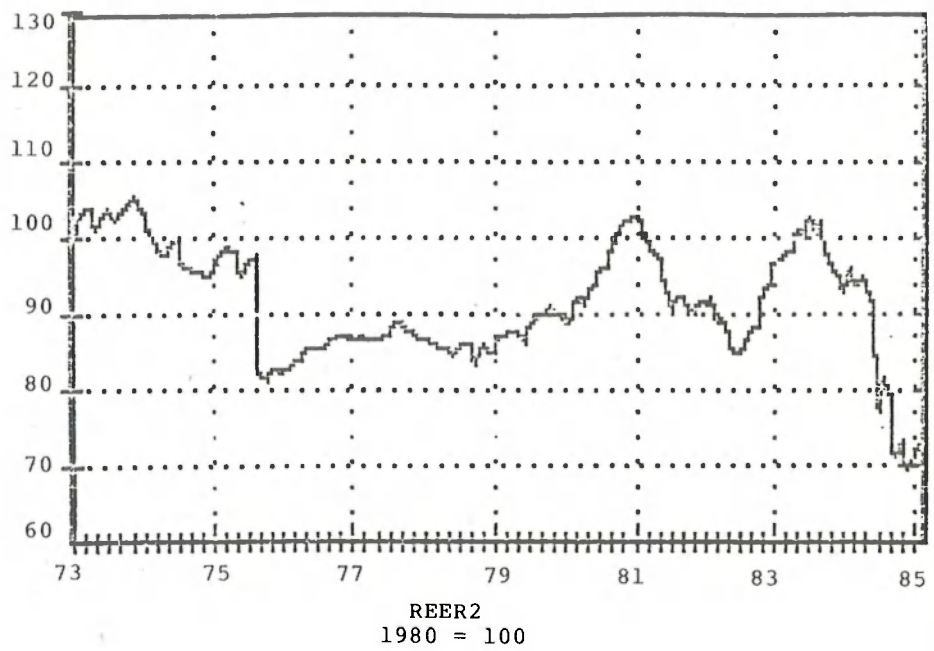
REER4
1980 = 100

Diagram 10



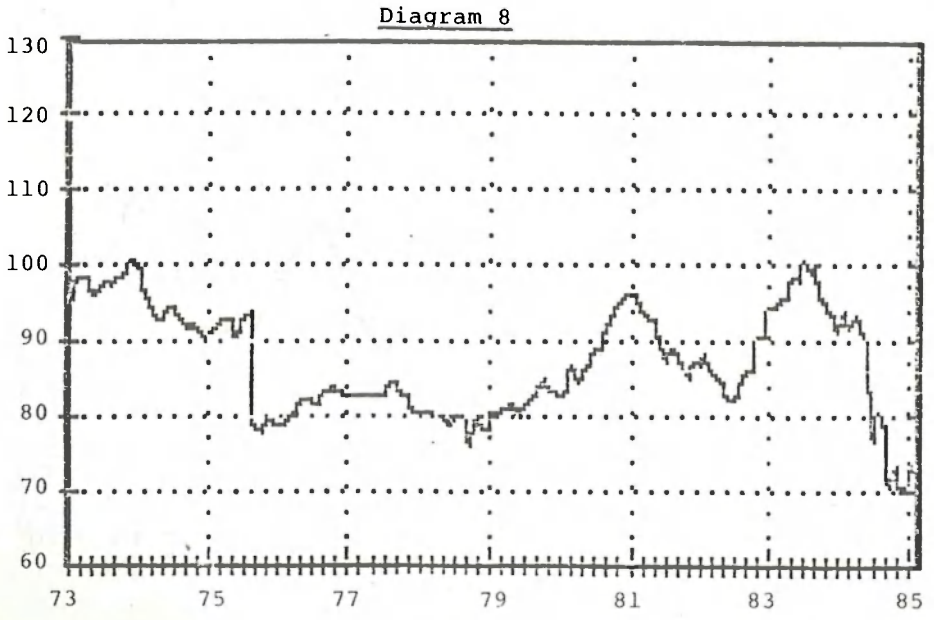
REER5
1980 = 100

Diagram 7



REER2
1980 = 100

Diagram 8



REER3
1980 = 100

show that in real terms the recent depreciation is substantially greater than at any time during the period over which the real exchange rates were calculated. In particular REER4 indicates that the current level of the real exchange rate is close to 20 per cent lower than it has ever been. When gold is excluded from the weighting pattern, however, the situation changes radically. Series REER5 shows that the amount of real depreciation that has occurred for exporters still has only just brought the real exchange rate back to the level that prevailed, albeit briefly in 1978-79. The competitive advantage afforded non-gold exports is not nearly as great as is indicated by calculations of real exchange rates using composite weights.

3. VARIABILITY OF REAL AND NOMINAL EFFECTIVE EXCHANGE RATES

The variability of both real and nominal effective exchange rates has risen sharply over the past several years. While this partly reflects the greater instability of exchange rates internationally, it is mainly due to a fundamental change in South Africa's exchange rate policy. The De Kock Report describes this evolution and refers to the current arrangement whereby, in the spot market, "the Reserve Bank no longer prescribes fixed buying and selling rates for dollars to be quoted by banks in their transactions with the public... Spot exchange rates for the rand are determined by supply and demand in a competitive market subject only to Reserve Bank 'intervention' or 'management' by means of purchases or sales of dollars" (De Kock Commission, 1985 p.A20). This policy amounts to managed floating and, in the Report, the view is expressed strongly that this is the most appropriate exchange rate policy within the South African context. Before attempting to evaluate whether this view is in fact correct, it is useful to examine just how much exchange rate variability has increased over the period under examination. Table 3 shows the variance of the import plus export weighted effective nominal and real effective exchange rates for the 1973-1984 period on a biannual basis.

Table 3 The Variance of Real and Nominal Effective Exchange Rates

	1973/74	1975/76	1977/78	1979/80	1981/82	1983/84
NEER	10,680	91,891	11,216	25,543	11,889	59,798
REER	12,292	42,497	1,804	25,908	32,718	113,369

As the table shows there has been a sharp increase in exchange rate variability in the past few years. Furthermore, the variance of the real exchange rate which is the one that influences consumption and investment decisions is now substantially higher than the variance of the nominal rate. By causing an increasing variation between South Africa's rate of inflation and that of its trading partners, monetary and fiscal policy appear to have been promoting the instability of the real exchange rate, a conclusion that will not surprise analysts of South Africa's economic policy over the past few years.

The greater variability in the real rate does not by itself give any indication of the monetary authorities' attempts to intervene to offset market forces. In the absence of intervention with a fluctuating rate, changes in the real exchange rate are those changes in the nominal effective rate which cannot be attributed to inflation differentials between countries. They reflect certain structural differences in real economic performance between countries. Factors such as a rise in a country's labour costs relative to its competitors or an unforeseen acceleration in the rate of monetary expansion will result in a real depreciation of its currency. Similarly, rising productivity in a country's manufactured tradeables, the Balassa effect, or a shift in international demand towards its traded goods, will result in a real appreciation of its currency.

4. PURCHASING POWER PARITY IN SOUTH AFRICA

Most economists believe in some aspect of the purchasing power parity theory of the exchange rate. In general, if a sufficiently long period of time is considered few would deny that purchasing power parity should hold. Disagreements as to its validity arise in the short run however, with many recent empirical studies showing an extremely poor performance of purchasing power parity (4).

If the exchange rate follows purchasing power parity (PPP), then the real exchange rate will remain constant. However, the circumstances under which real rates would remain constant, particularly in the short run, would be most unlikely. If the only shocks to the balance of payments were differing rates of inflation between countries, or if the elasticities of demand and supply for exports and imports were so high that real shocks could be absorbed by very small changes in the exchange rate, then we might expect purchasing power parity to hold. Purely monetary shocks which leave the relative price structure within a country unchanged, but which alter the level of prices, would be reflected in purchasing power parity in the exchange rate. However, real shocks such as differential changes in productivity growth (Balassa, 1964) or the oil price shock will lead to deviations from PPP, requiring a change in the exchange rate as well as in domestic and foreign price levels.

When testing for the existence of PPP it is important to allow for the endogeneity of both prices and exchange rates. Krugman (1978) points out that in a world where floating is managed, the monetary authority's behaviour will be affected by the exchange rate so that treating relative price levels as exogenous and performing a simple statistical test for PPP could well lead to rejection of PPP. Hakkio (1984) makes the same point, but in his statistical testing goes even further in allowing for third country effects which lead to more favourable

results for PPP for the 1970s.

4.1 Simple Tests of PPP

The relationship to estimate PPP can be written as follows:

$$\ln S_{it} = a_i + b_i \ln(P_{it}/P_t) + \mu_{it} \qquad (1)$$

where S_{it} = foreign currency units per unit of the domestic currency

P_{it} = price index for country i, in domestic currency

P_t = foreign price level, in foreign currency

The PPP relationship is usually tested bilaterally between two countries for two currencies. In the case of South Africa it was decided to test an import-weighted average of exchange rates, i.e., the nominal effective exchange rate, NEER1, against the domestic price level and a weighted average of price levels for South Africa's major trading partners. The relationship which was estimated substituted the nominal effective exchange rate (S) for S_{it}, and a weighted average of foreign price levels (P*) for P_t.

Equation 4.1 can now be written to read:

$$\ln S = a + b \ln (P/P^*) + \mu \qquad (2)$$

where S = the import weighted nominal effective exchange rate

P = consumer price level in South Africa

P* = weighted average of consumer prices for South Africa's trading partners

A simple test of PPP which was used by Frenkel (1976) was to regress the spot exchange rate on relative prices and test the hypothesis that b = 1 in equation (4.2).

Table 4 reports ordinary least squares based on monthly data equation (4.2). Three time periods were chosen: January 1973-October 1984; January 1973-December 1979 and January 1980-October 1984.

Table 4 Tests for PPP, Ordinary Least Squares (a)

Dependent Variable	Time period	a	b	SEE	$\bar{R}^2$	DW
Nominal Effective Exchange Rate	Jan 73-Oct 84	4,579 (729,875) (,006)	-0,929 (-18,0175) (,05)	0,007	0,696	0,15
Nominal Effective Exchange Rate	Jan73-Dec 79	4,513 (466,567) (0,01)	-1,629 (-17,0511) (0,1)	0,005	0,777	0,21
Nominal Effective Exchange Rate	Jan 80-Oct 84	4,584 (247,5) (0,02)	-0,814 (-6,431) (0,13)	0,007	0,414	0,23

Note: (a) The numbers in parentheses are t-statistics and standard errors respectively. In the regressions the nominal effective rate was regressed on relative prices (P/P*) according to equation (4.2) ln S = a + b ln (P/P*).

The first period chosen was one after generalised floating took place internationally The second period was one during which South Africa's exchange rate was more fixed, pegging in turn to the dollar and a basket of currencies. In 1980 the variability of the effective exchange rate increased markedly over that of the late 1970s and was then followed by the announcement in 1983 that the rand would follow a managed float. On this basis, the third period (January 1980-October 1984) marks one of greater variability in the rand.

The results of the test are mixed for PPP. Overall the estimate for b is quite close to -1 for the entire period. Variation occurs between the periods for, in the earlier more fixed period, the estimate of b is well off -1, whereas in the later flexible period it is closer to -1. The results of this test are doubtful due to the existence of severe serial correlation of the errors, as is indicated by the values of the Durbin-Watson statistics for all the regressions.

If first-order serial correlation of the errors is assumed the equations can be re-estimated using a Cochrane-Orcutt transformation. These estimates are presented in Table 5.

The estimates of b, after allowing for serial correlation, are sufficiently far away from -1 for the hypothesis that b=-1 to be rejected. This should therefore lead us to reject the hypothesis of PPP for South Africa for the period under consideration. However, comparing the estimates of b in Tables 3 and 4, it can be seen that they change quite substantially. This suggests that there is misspecification due to variables which have been omitted from the model and which are correlated with relative prices (5). Furthermore, the high values of P show that the estimated serial correlation is extremely high.

The conclusion on the basis of the above test would be that the exchange rate has not followed relative price changes during the period of generalised floating since 1973. Even allowing for

Table 5

Tests of PPP, Cochrane Orcutt (b)

Dependent Variable	Time Period	a	b	SEE	$\bar{R}^2$	P
Nominal Effective Exchange Rate	Jan 73 - Oct 84	4,319 (21,563) (0,2)	-0,299 (-1,054) (0,28)	0.028	0.96	0.989
Nominal Effective Exchange Rate	Jan 73 - Dec 79	4,549 (70,786) (0,064)	-0,661 (-2,280) (0,290)	0,025	0,96	0,957
Nominal Effective Exchange Rate	Jan 80 - Oct 84	2,931 (2,825) (1,038)	0,489 (0,795) (0,615)	0,033	0,88	0,995

Note: (b) The column headed P is an estimate of the coefficient of Serial correlation. The numbers in parentheses are the asymtotic t-statistics and standard errors respectively.

differences in the management of the exchange rate in the different periods would not substantially alter this conclusion.

4.2 Further Tests for PPP

The simpler tests for PPP might lead us to reject PPP, when in fact it may be true. Krugman (1978) shows that the misspecification in the model may be due to neither relative prices nor exchange rates being exogenous. This means that statistical problems would arise from the simple tests which were used previously for PPP. Only if monetary shocks are sufficiently large, and predominate, will the estimated coefficients be close to their true values with the simpler tests.

For those cases where monetary shocks have not been as extreme, one way of dealing with the problem of simultaneity is to use the instrumental variable technique. One difficulty with the technique however is the choice of instruments which are truly exogenous. Krugman (1978) suggests using a time trend as this should be uncorrelated with the errors in the PPP equation. Further instruments which could also be considered exogenous are lagged exchange rates and lagged relative prices. Table 6 shows the results of using instrumental variables on equation (4.2).

These results are very similar to those obtained using ordinary least squares. As before, however, there is severe serial correlation, as indicated by the Durbin-Watson statistics. The serial correlation is corrected for assuming first order serial correlation, and the results of the regression are reported in Table 7.

When the serial correlation is accounted for, the instrumental variables technique makes a difference. Both the estimates of the coefficients and the standard errors are altered. For the entire period of generalised floating the estimate of b does not change much, and it is not possible to

Table 6 Tests for PPP, Instrumental Variables Technique (a)

Dependent Variable	Time period	a	b	SEE	$\bar{R}^2$	DW
Nominal Effective Exchange Rate	Jan 73 - Oct 84	4,579 (729,871) (0,006)	-0,929 (-17,975) (0,05)	0.07	,697	,15
Nominal Effective Exchange Rate	Jan 73 - Dec 79	4,511 (454,077) (0,009)	-1,644 (-16,7996) (0,09)	0,06	,78	.21
Nominal Effective Exchange Rate	Jan 80 - Oct 84	4,581 (254,533) (0,018)	-0,801 (-6,452) (,12)	0,07	,41	,22

Note : (a) The instruments used to estimate equation 4 were a constant, time, time squared, lagged exchange rates and lagged relative prices. t-statistics and standard errors are reported in parentheses.

Table 7 · Tests for PPP, Instrumental Variables and Cochrane-Orcutt (a)

Dependent Variable	Time Period	a	b	SEE	$\bar{R}^2$	P
Nominal Effective Exchange Rates	Jan 73 - Oct 84	4,534 (82,095) (0,005)	-0,921 (-2,618) (0,35)	0,028	,95	0,955
Nominal Effective Exchange Rate	Jan 73 - Dec 79	4,529 (121,652) (0,003)	-1,298 (-3,707) (0,35)	0,025	0,96	0,905
Nominal Effective Exchange Rate	Jan 80 - Oct 84	3,233 (3,227) (1,002)	0,231 (0,314) (0,737)	0,032	0,88	0,994

Note: (a) The instruments used to estimate equation 2 were a constant, time, time squared, lagged exchange rates and lagged relative prices. t-statistics and standard errors of the coefficient are reported in parentheses.

reject the hypothesis that b = -1 at the 95 per cent level. During the earlier more fixed period the estimate of b changes substantially and it is clear that the hypothesis that b = -1 cannot be rejected at the 95 per cent level for this period either. However, since the management of the rand became more flexible, purchasing power parity was seen not to apply. In all cases the estimated serial correlation was seen to decline as a result of using the technique of instrumental variables; however, despite the decline in serial correlation it still remains high. This is largely due to the use of monthly data but could also be taken as evidence of omitted variables in the determination of the exchange rate. This is probably more of an indication of the success of economic models rather than an indictment of the validity of PPP.

In order to ascertain whether the relationship between the nominal exchange rate and relative prices was stable in the two sub-periods, a Chow test was performed on the two separate regressions The result of this test was that the hypothesis of stability could not be rejected. Therefore, the nominal effective exchange rate and relative prices were indeed related in both periods but purchasing power parity did not hold in the later period.

In general, purchasing power parity could also be said to hold if the real effective exchange rate was relatively constant as prices and tne nominal exchange rate changed. Diagram 6 shows movements in the real effective rate from January 1973-February 1985. From January 1973-December 1979 the real rate was reasonably constant, except for the 17,9 per cent devaluation of the rand against the dollar which occurred in September 1975. Table 8 shows the variances, and variance ratios, for the nominal and the real effective exchange rates for selected periods.

Table 8 Variances and Variance Ratios for Nominal and Real Effective Rates

Time Period	Variance of Nominal Effective Rate	Variance of Real Effective Rate	Variance Ratio (a)
Jan 73-Sept75	10,381	11,459	0,906
Oct 75-Dec 79	18,273	4,135	4,419
Jan 73-Dec 79	167,506	55,196	3,035
Jan 80-Oct 84	66,247	44,152	1,500

Abstracting from the September 1975 devaluation of the rand, it can be seen that the variability of the real effective exchange rate increased markedly in the period January 1980-October 1984. It is interesting that in the period October 1975-December 1979 the variance ratio was at its highest and the variance in the real rate at its lowest.

4.3 Conclusions

Having viewed the evidence for South Africa on nominal effective exchange rates and relative prices it was found that the simpler tests for purchasing power parity led to a rejection of the PPP hypothesis. Once the problems of simultaneity were accounted for, however, the known results for South Africa were more favourable for purchasing power parity in the entire period January 1973-October 1984. A further examination of the data for the two periods of greater and lesser flexibility in the management of the rand, in an era of generalised floating, revealed the interesting result that purchasing power parity had been better approximated during the earlier more fixed period. Once the management of the rand was more flexible, be it the practice of variable dollar pegging or the managed float which followed, purchasing power parity was found not to apply. Real

shocks to the economy in the form of the increase in the price of gold in 1979 and 1980 and again in the second half of 1982, led to a real appreciation of the rand. Furthermore, the fall in the price of gold and the strength of the dollar in 1983, led to a real depreciation of the rand which was reflected in substantial deviations from purchasing power parity in this period.

5. THE EFFECTIVE EXCHANGE RATE AND THE EXPORT SECTOR

The exchange rate is determined by forces affecting not only the current account but also the capital account of the balance of payments. In South Africa a major component of the current account is gold receipts. On the capital account, capital flows occur in response to a variety of stimuli including interest rates, exchange rates and long-term relative profitability. On the capital account there is the additional factor of internal political instability and world perception of this instability. Within a more flexible exchange rate system, both of these factors would lead to changes in the real exchange rate which may not be sustainable in the long run.

It has been recognised that in South Africa sharp changes in the price of gold would have substantial effects on the exchange rate if the rate were free to respond to these changes. With an increase in the price of gold at a given real exchange rate, exports would rise and the current account would go into surplus. However, only part of the extra income generated by the increased exports of gold would be spent on imports and exportables, moderating the surplus, and part of the additional income would be spent on home goods and services, leaving a current account surplus and requiring a real appreciation of the rand. If exchange control is relaxed some of the higher income may be used to buy foreign financial assets moderating the extent of the appreciation. Nevertheless, the rise in the price of gold induces a movement of resources out of non-gold mining tradeables into non-tradeables due to the increased profitability of non-tradeable production. Furthermore, the greater the increased demand for non-tradeables, the greater the required real appreciation.

The fall in the prices of import competing and exportable goods relative to the prices of non-tradeables, and the resultant decline in the production of non-gold mining tradeables, has been

termed the Gregory effect or the Dutch disease. In the simpler three-sector models, e.g., gold mining, non-gold mining tradeables and non-tradeables, with specific factors and one mobile factor, it can be shown that non-gold mining tradeables contract. However, more sophisticated models have shown the possibility of parts of the non-gold mining tradeables actually expanding as the sector as a whole contracts (6). The manufacturing sector, being an important user of imported inputs, may also gain from an appreciation in the form of lower relative prices for these inputs despite their lower output prices. Those parts of manufacturing competing with imports would, of course, unambiguously lose. The real losers of a real appreciation of the rand would be the agricultural exporters who have lower imported input requirements but also face an inelastic domestic demand for agricultural products.

What has not been emphasised in South Africa is the converse of the Dutch disease when the price of gold falls, requiring a real depreciation of the rand. The fall in export receipts would be reflected in a current account deficit at a given real exchange rate. This deficit would, however, be moderated to the extent that the decrease in income affects imports; nevertheless, only part of the decrease in income would not be spent on imports, leaving a current account deficit and requiring a real depreciation of the rand. As before, the decrease in income would also imply a decrease in the purchase of foreign financial assets hence also moderating the extent of the depreciation. In this case, once again, this implies a movement of resources out of non-tradeable production and gold mining into non-gold mining tradeables due to the decreased profitability of these sectors. This particular movement of resources may be appropriately named the 'South African' disease.

Changes in the real exchange rate could also occur if there are movements of capital into and out of the country. Capital movements with a fixed exchange rate led to a substantial loss of foreign reserves during the Sharpeville period, and more recently

to an unacceptably sharp real depreciation of the effective exchange rate.

Mundell (1960) has pointed out that, if capital is highly mobile with flexible exchange rates, through the exchange rate the current account would have to adjust to these capital flows implying shifts in domestic resource allocation. Corden (1982) outlines the economic effects of an investment boom in Australia in terms of a real appreciation of the local dollar which also produces a variant of the Dutch disease. One could argue that capital outflows could be treated as a disinvestment boom as opposed to an investment boom. A current account surplus equal to the capital outflow would have to be generated. If the whole of investment spending had been on imports then the required surplus would be generated. However, it is more likely that investment spending had been partly on home produced goods and services as well, and that the decline in spending on these goods should lead to a fall in the price of these goods relative to the South African currency prices of imports, i.e., a real depreciation of the rand (7). The real depreciation of the rand decreases the demand for imports and increases the demand for home goods (including non-tradeables as well as exportables), producing part of the required current account surplus to equal the capital outflow. Considering the composition of home produced goods (import competing, exportables and non-tradeables), the decrease in the relative price of non-tradeables to tradeables alters the pattern of domestic output with resources shifting into tradeables away from non-tradeables, i.e., once again the South African disease. In addition, it is quite likely that absorption will have to be reduced further in order to generate the required current account surplus.

It is interesting that in the past a rise in the price of gold has also been accompanied by inflows of capital for the purchase of shares on the Johannesburg Stock Exchange, and similarly a falling gold price has been followed by capital outflows. These flows will have accentuated the required

appreciation and depreciation of the rand, and the concomitant shifts in resources.

In an attempt to isolate some effects of the Dutch disease on the export sector, a partial equilibrium model was constructed for manufacturing and non-gold mining exports using quarterly data for the period 1973-1984. Attempts to model agricultural exports were unsuccessful largely due to recurring drought during this period.

An excess demand function in domestic currency for exportables from South Africa took the following form:

$$Q_{DX} = f(P_X, P^*, e, Y^*)$$

where Q_{DX} = quantity of exports demanded
P_X - domestic currency price of exports
P^* = foreign prices
e = effective exchange rate (NEER 5)
Y^* - foreign incomes

The excess supply function in domestic currency for exportables was specified as follows:

$$Q_{SX} = g(P_X, P_y, Y - \bar{Y})$$

where Q_{SX} = quantity of exports supplied
P_X = domestic currency price of exports
P_y = domestic currency prices of other goods
$Y - \bar{Y}$ = deviations from trend GNP

The expected signs of the coefficients for the demand equation are:

(1) $f_{p_x} < 0$ One would expect from demand theory that there should be an inverse relationship between price and quantity demanded.

(2) $f_{p^*} > 0$ The higher are foreign prices, the greater should be the demand for South African exports.

(3) $f_e < 0$ The lower the effective exchange rate the greater would be the demand for exports, i.e., a depreciation of the rand has the effect of shifting the export demand schedule rightwards. The export-weighted (excluding gold) effective exchange rate was used.

(4) $f_{y*} > 0$ The demand for South African exports should be positively correlated with increasing incomes in its trading partners.

The expected signs of the coefficients for the supply equation are:

(1) $g_{P_x} > 0$ This follows from the theory of supply.

(2) $g_{P_y} < 0$ Models have shown that the higher prices of other goods are, the lower relative profitability in this activity would be and therefore the lower the quantity supplied.

(3) $g_{Y-\hat{Y}} < 0$ If actual GNP is greater than trend GDP then the excess supply of exports available would be lower, whereas if actual GNP is less than trend GNP the greater the excess supply of exports. This variable incorporates both domestic demand and supply influences on exportables.

Table 9 shows the results of estimating these equations for both manufacturing and non-gold mining exports. Sources of data and the construction of the variables are given in Appendix B.

As a stock adjustment model was assumed when estimating the equations, a lagged endogenous variable appears in each of the equations. Furthermore, as quarterly data were used, quarterly dummies are included in each equation.

TABLE 9 Estimates of Export Demand and Supply Equations for Manufacturing and Non-gold Mining (a).

Dependent Variable	Constant	P_X	P*	e	Y*	P_y	$Y-\hat{Y}$	Q (-1) DX	Q (-1) SX	QTR1	QTR2	QTR3	$\bar{R}^2$	h	p
MANU-FACT															
Q_{DX}	155,631 (4,198)	-0,898 (-31,037)	2,208 (25,659)	-1,026 (-6,450)	0,331 (13,148)			0,168 (.004)		12,989 (2,944)	8,859 (2,008)	10,572 (2,396)	0,74	2,21	
Q_{SX}	5,104 (0,259)	1,496 (34,087)				-2,154 (-24,589)	-0,007 (-5,258)		0,002 (,002)	-23,913 (-3,573)	-2,751 (-,411)	-1,658 (-0,248)	0,79	2.24	
NON-COLD MINING															
Q_{DX}	797,401 (9,045)	-3,193 (-19,421)	4,878 (7,173)	-7,280 (-5,793)	1,494 (7,508)			0,748 (3,797)		44,152 (1,267)	30,341 (0,871)	35,328 (1,014)	1,46		,037
Q_{SX}	3,777 (0,125)	0,158 (2,196)				1,892 (9,449)	-0,005 (-1,706)		-,139 (-1,608)	11,003 (0,719)	29,594 (1,934)	5,547 (0,362)	,66		,112

(a) The manufacturing export equations were estimated using two stage least squares. The h-statistic rather than the Durbin-Watson statistic was calculated to test for serial correlation. This was due to the presence of a lagged endogenous variable in the equations. The non-gold mining equations were estimated using two stage least squares and a Cochrane-Orcutt transformation as the h-statistic indicated the presence of serial correlation; t-statistics are presented in parentheses below each estimated coefficient. The $\bar{R}^2$, has to be treated with caution as it is not as accurate as the $\bar{R}^2$ obtained using OLS.

The results show that the effective exchange rate is a highly significant determinant of the demand for both South African manufacturing and non-gold mining reports. Bearing in mind the estimation procedure used whereby the quantity demanded and supplied and the prices of exports were treated as endogenous variables, shifts in the exogenous variables feed into the determination of these endogenous variables in the model. For example, a depreciation of the rand through its effect on the demand for exports raises the domestic currency price of exports which expands the supply of exports, i.e., within the partial equilibrium model this increase in the price of exports represents a real depreciation of the rand.

Apart from the quarterly dummies and the lagged terms, all variables in the model were significant at the 95 per cent level and above. An exception to this was the variable measuring the deviation from trend income in the mining equation. This implies that mining exports have been little affected by excess demand in the South African economy, whereas in manufacturing the coefficient on this variable was significantly different from zero with a standard error of 0,001, confirming the result obtained by Meyer (1979) as to the recession-boom effect on South African manufactured exports. It is also interesting that the sign on the coefficient of domestic prices of other goods in the mining supply equation did not conform to expectations, implying that the supply of mining exports was directly related to relative profitability in the domestic sectors of the economy. This could perhaps be explained by the intermediate good nature of mining products whereby their supply to the domestic economy would be positively correlated with profitability elsewhere. As can be observed from the size of the coefficients on the price terms in the export supply equations, the effect of a change in price is far greater in manufacturing than in mining. When elasticities of supply were calculated from the equation allowing for the lagged coefficient in the equations and using average prices and volumes, values of 2,29 and 0,19 for manufacturing and mining respectively show that manufacturing supply is more

sensitive to price than is mining supply.

The main conclusion that emerges from the model is that during the period 1973-84 changes in the effective exchange rate for the rand had indeed affected resource allocation. At times of a real depreciation the volume of exports of manufacturing and mining had expanded, whereas with real appreciations of the rand, the volume of exports had contracted. It would appear that apart from having Dutch forebears South Africa is also entitled to its own form of the Dutch disease.

6. FORMULATION OF EXCHANGE RATE POLICY

In order to measure empirically the stance of exchange rate policy in South Africa, a measure of the flexibility of the exchange rate developed elsewhere (Holden et al, 1979) was used.

The index was originally calculated for 76 countries for the 24-month period to December 1975 using the formula:

$$F^i = \sum_{k=0}^{23} (\{| E_{t-k} - E_{t-k-1} |\}/E_{t-k-1}) / \sum_{k=0}^{23} \left[{}_{t-k} - R_{(t-k-1)} / \{ \sum_{j=0}^{11} (X_{t-k-j} + I_{t-k-j}) \} \right]$$

where E_t = an index of the trade weighted exchange rate of country i at time t

R_t = US dollar value of country i's holdings of foreign exchange at time t

X_t = US dollar value of exports of country i in month t, and

I_t = US dollar value of imports of country i at time t.

The rationale for using this ratio as an indicator of exchange rate policy is that if the change in reserves (R) is high in relation to the change in the exchange rate (E), and therefore F is comparatively small, the monetary authorities are intervening relatively heavily to offset market fluctuations. Conversely, if the change in the exchange rate is high relative to the change in reserves, the monetary authorities are allowing exchange rate changes to occur with little intervention and are following a relatively flexible exchange rate policy. Clearly, the index has no meaning in an absolute sense, but on a comparative basis, either between countries or for an individual country at different times, the index provides insights into the exchange rate policy stance.

Individual countries' flexibility scores were then related to predicted values of the flexibility index based on variables which theoretical considerations indicate should influence the flexibility of exchange rate policy. These variables are: openness, capital mobility, diversification of the external

sector, geographic concentration of trade, degree of economic development, and the degree of divergence in the inflation rate between South Africa and its trading partners. They are derived from optimum currency area theory (8), a body of literature that has developed rapidly over the past few years.

In this literature it has been shown that:

(a) The more open an economy, the smaller would be the degree of exchange rate illusion, and therefore the less effective would an exchange rate change be in altering the real exchange rate. Furthermore, with fixed exchange rates and with larger leakages in an open economy, the more effective is the use of demand management in correcting imbalances in the current account. It would therefore seem that exchange rate flexibility would be less appealing to more open economies.

(b) The implication for capital mobility is more ambiguous. It has been shown that the greater the degree of capital mobility with fixed exchange rates the more difficult it is for monetary policy to be independent. In addition, monetary policy is more effective with flexible rates than fixed rates. In contrast, fiscal policy is less effective under flexible rates in the face of highly mobile capital and capital mobility, by aggravating the fluctuations in the exchange rate, will cause domestic resource allocation changes through the current account.

(c) The more diversified the external sector, for a given degree of opennness, the more likely it is that external disturbances will offset one another. A policy of non-intervention under these circumstances will result in little change in the exchange rate. It follows then that greater diversification of the external sector should be accompanied by more flexible exchange rates.

(d) The greater the geographic concentration of trade, the stronger the incentive for the smaller country to peg its currency to that of its major trading partner.

(e) The lower the level of economic development and the less

developed and inflexible are goods and factor markets the greater the case for a more fixed exchange rate.

(f) The more a country's inflation rate diverges from that of the rest of the world, so the greater the need for a more flexible exchange rate.

The value of the flexibility index was then regressed on the values of the six variables for 76 countries for the period 1974/75. Forty-two percent of the intercountry variance of the flexibility index was explained with five of the characteristics (openness, diversity, concentration, development and inflation divergence) having the expected sign and being significant. Capital mobility with a negative sign on the coefficient implied that the more mobile capital is the less flexible was the regime followed. However, the variable was also found to be insignificant.

Differences between the actual and predicted values of the flexibility index therefore indicated how countries were in practice deviating from their theoretically determined optimal degree of exchange rate flexibility. While the index has several obvious drawbacks (9) and, as Argy (1982) has pointed out, this measure "at most .... would reveal that a particular country ought to have a more or less flexible rate, given its unique combination of characteristics", it still provides a useful indicator of the flexibility of exchange rate policy. In the original calculations, it was fo nd that South Africa's flexilibity score (0,8 compared with a median score of all countries in the sample of 0,42), was one of those in which there was the greatest divergence, in a too flexible direction, between actual and predicted values of the flexibility index. In recalculating this measure for 1984 it was found that, while all countries' flexibility scores were substantially higher than in the original calculation, undoubtedly reflecting the greater exchange rate flexibility of the late 1970s and early 1980s, South Africa's score was 5,99 (compared with a median score of 2,45) - one of the highest calculated and much higher than

predicted by the theoretical model.

This result was not surprising given the extreme openness of the economy, the high product concentration in export trade, and the geographical concentration of trade. South Africa is, however, a middle-level country in terms of economic development and over the last few years has experienced inflation rates which have exceeded those of its trading partners. Both of these factors would have raised the predicted flexibility score; however, the influence of the other variables predominated in raising the predicted score.

The measure used above indicates the much greater variability in exchange rates and exchange rate policy. Given the openness of the South African economy, the exchange rate is the most important single price ruling in the economy, and it is therefore vital that the rationale for this policy shift be examined critically. To do this, one must first ask what guides there are to exchange rate policy formulation. Williamson has put this most succinctly: " .... the principles implicit in the design of the founding fathers of Bretton Woods have never been bettered. The basic concept embodied in the Bretton Woods system was that countries should aim at continuous internal balance, but be content to ensure that external balance is satisfied on average over the medium term.... Why the asymmetry? Because departures from internal balance, appropriately defined, always involve a welfare cost, whereas variations in reserves .... provide leeway for departures from continuous external balance". (10).

It is interesting that the De Kock Commission's advocacy of floating exchange rates comes at a time when there is an increasing body of literature attesting to the failure of floating exchange rates since 1973 to fulfil the promises of its advocates (11). Undoubtedly it is true that no other system of exchange rates could have handled the supply side shocks of the 1970s yet the adjustment that occurred was different from that

which had been anticipated. The promised insulation of domestic economies from external shocks failed to materialise and the sought after goal of monetary independence has disappeared with the growing realisation that international economic stability will require greater harmonisation of economic policies of at least the industrialised countries. This has been recognised in the principles for IMF surveillance which came into effect in March 1978. In particular, Principle B is of interest in that it provides that "a member should intervene in the exchange market if necessary to counter disorderly conditions which may be characterised inter alia by disruptive short-term movements in the exchange value of its currency" (12). One of the indications of the pursuance of an inappropriate exchange rate policy would be "exchange rate behaviour that appears to be unrelated to underlying economic and financial conditions affecting competitiveness and long-term capital movements" (13).

The question which arises is whether the more flexible exchange rate policy which we have recently observed is appropriate for South Africa. To answer this question it should be kept in mind that the goal of policy should be to stabilise the real effective exchange rate at a level which would be consistent with a long-term balance of payments equilibrium with reserves at a level which permits intervention to achieve this stabilisation.

We have seen that fluctuations in the price of gold and movements in short-term capital can have destabilising effects on the real exchange rate if intervention is not resorted to. Furthermore, we have seen that changes in the real exchange rates are efficient only if they do not lead to violent short-run exchange fluctuations which are wasteful and expensive in terms of resource movements Joshi (1979 p.12). It can be argued that producers are not that shortsighted in that they move resources around on the basis of current exchange rates. Nevertheless the stock adjustment model of demand and supply for exports in South Africa did show the responsiveness of producers to the changes in

the exchange rate, particularly in manufacturing.

The difficulty with formulating exchange rate policy in South Africa has been exacerbated by the volatility of the price of gold and the problems with predicting the long-run trend in its price. In addition, in the recent past there has been an increase in external political pressures with the threat of disinvestment and also possible export sanctions. If disinvestment were to occur this would imply a fundamental change in the structure of the balance of payments. In addition, export sanctions would imply a discrete shift in the demand for South African exports. Both of these events would mean a sharp shift downwards in the long-run equilibrium exchange rate.

Intervention should be directed at dampening the effect of uncertainty on the real sector of the economy by preventing the wild swings in exchange rates that have occurred so far in 1985. However, such a policy will require a substantial increase in reserves for the larger the disturbances impinging on the balance of payments with a more fixed rate, the greater the need for reserves. It is also clear that an increase in the stock of reserves at present would entail resisting any upward movement in the rand for the time being.

The De Kock Commission recommends that the Reserve Bank intervene in the foreign exchange market in order to smooth exchange rate movements both in the short and the longer run when the rise or decline of the rand is judged to be temporary. It is not a question of the Bank knowing better than the market but rather recognising the effects of market signals on resource allocation in the economy. In particular, the Commission acknowledges the effects of the Dutch disease in the face of large and sudden movements in the price of gold, and recommends intervention to facilitate the adjustment in the economy to a higher or lower price, rather than make the adjustment unnecessary. One could interpret this form of intervention as delaying a sharp rise in the exchange rate in the face of a

rising price of gold until one can ascertain whether the change will be long lasting or not. Even so, the Commission recommends that ultimately adjustment to the balance of payments may not occur through the exchange rate, as measures to encourage equilibrating capital flows through relaxation of exchange control, fiscal incentives, interest policy and forward exchange intervention could be taken. It is very clear from the Report that monetary and fiscal independence will not be achieved under a managed float for the level of the exchange rate will operate as a constraint to both monetary and fiscal policy.

Nevertheless, the Commission does not recommend the use of exchange rate targets. And, paradoxically, it then justifies this decision on the grounds that an exchange rate target would place unacceptable restraints upon the setting of targets for monetary policy. The target approach assumes that the monetary authorities have information about the long-run equilibrium exchange rate and that there are benefits to be had from keeping the rate close to this level. By implication it assumes that the private sector would not keep the rate at this level.

The concept of a long-run equilibrium rate has often been misinterpreted as an attempt to re-establish a par value system. It should be noted that the long-run equilibrium rate is not one which is immutably fixed in time or which only changes gradually. It would also take into account discreet shifts in policy and changes in economic developments. The long-run rate is more stable than the rate determined solely by market forces however because this latter rate is affected by the instability in the short-run demands for, and supplies of, various domestic and foreign financial assets (14), as well as cyclical and other temporary variations in the current balance.

The concern that has been expressed in this paper has centered largely on the resource allocative effects of instability in the real exchange rate. In addition, there is the concern that the depreciation of the exchange rate may act as a

source of inflation in itself. Any inflation must be ultimately validated by the monetary authorities so that in the long run exchange rates cannot independently affect price changes. Nevertheless, if monetary authorities cannot control the money supply or if its control is politically infeasible, then inflation as a result of an asset market-related depreciation of the rate could be self-validating. It is therefore crucial that the target exchange rate be consistent with both monetary and fiscal policies creating a need for methods to determine such an exchange rate target.

The best-known proposal for determining a target exchange rate is based on the theory of purchasing power parity (PPP). The target should then be determined by trends in domestic prices relative to a weighted average of foreign prices. It has been shown that over the long run purchasing power parity has in fact held for South Africa in that deviations of the exchange rate from its PPP value were self-correcting. It should be borne in mind, however, that the long-run equilibrium value of the exchange rate is a function of prospective, not current, PPP.

Purchasing power parity is one such method for determining a target exchange rate. Another approach which obviates some of the problems associated with PPP, is to set the rate so that it is consistent with a cyclically adjusted long-run basic balance (see Artus, 1978).

A target exchange rate does not imply a return to the Bretton Woods System where a target zone is set and monetary authorities intervene to keep the rate in that zone. The Bretton Woods system also implies the need for a precise measure in order to assess any deviations from the long-run equilibrium rate. Neither of the measures that have been suggested above will provide this. These measures are merely rough guidelines to assist the monetary authorities in preventing the wild swings that have occurred in the exchange rate in the recent past.

7. SUMMARY AND CONCLUSIONS

This paper has shown that changes in real exchange rates have not been as large as changes in nominal rates would indicate. Although real rates have, on average, depreciated by less than nominal exchange rates, the variability of real rates is now higher than that of nominal rates. Furthermore, it has been shown that changes in effective exchange rates have affected the movement of resources into and out of the exports of manufacturing and non-gold mining, and it is in this light that the variability in rates must be viewed.

The observed increased variability in rates also leads to the conclusion that managed floating has been conducted in such a manner as to allow for far too great a degree of flexibility in the exchange rate, an observation that is supported by measurements of South Africa's exchange rate flexibility score. This conclusion must be viewed within the context of the particularly high degree of uncertainty that South African policymakers have to deal with at present. It is possible that political factors may force a fundamental change in the structure of South Africa's balance of payments. Conceivably, current account shocks in the form of trade sanctions could be added to the capital account shocks that are currently being experienced, in which case the equilibrium real exchange rate is probably lower than would have been estimated at the beginning of 1985.

Although it was found that over the period 1973-1984 purchasing power parity had held, the latter part of the period was marked by sharp deviations from purchasing power parity. Despite the rejection by the De Kock Commission of adopting exchange rate target, it is suggested in the paper that implicit in the recommendations of the Commission is an unstated target, and the paper suggests that this target could be broadly achieved by a number of alternative measures, one of which incorporates purchasing power parity.

APPENDIX A

The countries in the sample from which the exchange rate statistics were calculated are:

Australia	Belgium
Brazil	Great Britain
Canada	France
Germany	Italy
Japan	Netherlands
Spain	Sweden
Switzerland	United States of America

Sources of Data

Trade Data: South African Statistics, Government Printer, Pretoria

Price and Exchange Rate Data: International Financial Statistics, International Monetary Fund, Washington, D.C.

All data for the flexibility index were taken from International Financial Statistics and Direction of Trade, International Monetary Fund, Washington, D.C.

APPENDIX B

Px Unit Values indices were used as a proxy for the export prices of manufactures and mining.

P* A foreign price index was constructed using consumer price indices and weighted according to the share of each partner in South African exports.

e The nominal effective exchange rates with export weights excluding gold were used.

Y* A world trade index was constructed as a proxy for world incomes. Weights were determined according to each trading partners' share in South African exports.

Py The South African consumer price index.

Y-Ŷ Deviations of actual real GDP from trend GDP.

Source: Bulletin of Statistics, Central Statistical Services.
International Financial Statistics,
International Monetary Fund.

FOOTNOTES

1. Described in Artus and Rhomberg (1973).

2. See Dixon and Powell (1979).

3. For nominal and real effective exchange rates, February 1985 was chosen as the cutoff date because this was the latest month for which price data were available for all the countries in the sample. Calculations to July 1985 using data based on extrapolations of the price series are available on request.

4. See Frenkel (1981) and Dornbusch (1980). Although estimates for the 1920s conform fairly well to PPP, those of the 1970s do not.

5. The change in the estimates of b when allowance is made for serial correlation have also been noted by Krugman (1978).

6. See Snape (1977), Corden & Neary (1982) and Corden (1978).

7. A real depreciation can also be defined as a fall in the relative price of non-tradeables to tradeables, or equivalently as a rise in the price of tradeables to non-tradeables.

8. "The theory of optimum currency areas provides theoretical insights that .... force researchers to attack the issues not in the abstract all or none terms of much of the debate over fixed versus floating rates, but rather in terms of the search for major factors that influence the relative desirability of alternative exchange rate systems."

9. See Holden, Holden & Suss (1979) for a full discussion of these.

10. Williamson (1982), pp.39-62. The cost of these departures is the cost of holding reserves which almost certainly is substantially lower.

11. Dunn (1983) and McCulloch (1983) provide insightful and comprehensive overviews of the experience with floating.

12. Article 10 of the Second Amendment to the International Monetary Fund Articles of Agreement.

13. Ibid.

14. The asset market approach to exchange rate determination explains why market forces can fail to stabilise the rate. Exchange rate 'overshooting' is now firmly entrenched in the literature as a phenomenon. See Dornbusch (1976) and Branson (1976).

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